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ABSTRACT

One role of counselors and educators is to use assessment in the service of students and clients. Under the right conditions and with proper use, using technology to foster assessment is a great way to go. This chapter focuses on the use of technology as a tool for testing and assessment. It emphasizes that to make proper use of technology tools, savvy counselors and educators need to: (1) understand the advantages and pitfalls of technology use, particularly as they relate to the use of assessment tools with clients and students; (2) follow the assessment standards and policies of applicable professional association; (3) use the best practices suggested in this chapter to better assure good service to their clientele; and (4) stay updated on topics related to assessment and technology. The chapter presents cautions and capabilities related to the use of technology with assessment. Standards and policies on assessment that have been prepared and endorsed by professional associations and organizations are provided, and various guidelines are outlined so that technology can be used with quality assessments for the purpose of aiding individuals in reaching for their goals and aspirations. The chapter also suggests ways of staying current within the field of assessment, particularly as it relates to technology. (MKA)

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Technology-Delivered Assessment: Power, Problems, and Promise

JANET E. WALL

An explosion! An upheaval! A revolution! Those words are often used to describe the remarkable influence of technology on our lives. Bill Gates, in his most recent book, speaks of a web workstyle and web lifestyle to describe how technology has permeated all aspects of our lives (Gates, 1999). Education has been a prime beneficiary of technology's power. Computers used for instruction will grow to over 10 million by the beginning of the 1999–2000 school year (Anderson & Ronnkvist, 1999; Quality Education Data, 1998). More than 75% of classrooms are equipped with computers, with a majority having Internet access. As more technology becomes available, it becomes integrated more fully into the mainstream of the educational process (Market Data Retrieval, 1998).

Never before has so much information been available for individuals to learn, make decisions, and take actions. Counselors and educators who think technology is another passing fad are sorely out of step.

One role of counselors and educators is to use assessment in the service of the students and clients. Under the right conditions and with proper use, using technology to foster assessment is a great way to go. This chapter focuses on the use of technology as a tool for testing and assessment and emphasizes that to make proper use of technology tools for assessment, savvy counselors and educators need to

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- understand the advantages and pitfalls of technology use, particularly as they relate to the use of assessment tools with clients and students;
- follow the assessment standards and policies of applicable professional associations;
- use the best practices suggested in this chapter to better assure good service to their clientele; and
- stay updated on topics related to assessment and technology.

This chapter thus presents cautions and capabilities related to the use of technology with assessment. Standards and policies on assessment that have been prepared and endorsed by various professional associations and organizations are provided, and various guidelines are outlined so that technology can be used with quality assessments for the purpose of aiding individuals in reaching for their goals and aspirations. The chapter also suggests ways of staying current within the field of assessment, particularly as it relates to technology.

UNDERSTANDING THE ADVANTAGES OF ASSESSMENT VIA COMPUTER AND THE INTERNET

The tools of technology offer counselors and educators new capabilities and opportunities to add value to their services. These include

- **accessibility:** Various tests are increasingly available via the computer and over the Internet. Individuals can take various tests for many purposes including college entrance, course placement, certifications and licensure, career decision making, academic achievement, military selection and classification, personality assessment, and test preparation. Each year the list expands. The availability of locations where assessments can be taken range from the privacy of one's home to organized computer laboratories in colleges, high schools, and the private sector. Although there seems to be a disparity in the degree of access to technology, Bill Gates, in his book *The Road Ahead,* (1995), suggested that individuals who are "wired" have access to the same information. He proposed that virtual equity is achievable more easily than real-world equity.

- **immediate feedback:** The potential for immediate test scoring and feedback is a key advantage with technology-delivered assessment that can be a significant motivator for persons taking assessment instruments. Individuals can learn their status on assessments quickly and use that information to take immediate action. For example, information made available immediately on a college course placement test can assist both students and counselors in registering students for the appropriate level of mathematics class or language program. High school students can acquire immediate information on their performance on academic tests and plan their courses accordingly. Students taking an interest inventory can obtain their results promptly and immediately investigate occupations and job openings that fit their interest profiles.
- **ability to use new assessment theories:** The use of computer-adaptive testing, as opposed to computer-assisted testing, allows persons to take tests that are targeted more accurately to their ability levels (Heubert & Hauser, 1999). Use of technology in combination with the increasingly popular item response theory can determine an individual's performance level using fewer questions to perform this task. The time and money saved by using computer-adaptive testing can be substantial, particularly in large-scale assessment situations or when time is a critical consideration.
- **portfolio assessment:** The capability of placing one's work or educational history on a floppy disk and making that information available to those judging performance or capability is empowered by technology. Writing samples, art work, letters of recommendation, journals, test results, certificates and certifications, community service, club memberships, and project work can be saved electronically, transported easily (either physically or electronically), and evaluated by others to make decisions related to educational promotion, graduation, job entry, and other purposes.
- **ability to assess higher order skills:** Use of technology permits test developers to use techniques and create situations that are difficult or impossible to construct in regular paper/pencil assessments. Consequently, and with some creativity, the assess-

ment can reflect more authentic conditions and may provide the capability of tapping into higher order cognitive skills than can be accomplished with a paper/pencil instrument. For example, test developers can construct situations that simulate the real world. Test items on computer can simulate events in biology or economics and ask students to take measurements, make observations, and analyze results, and then to propose a theory on how the world works in that subject area. A licensure test in architecture can simulate the tools an architect uses to create blueprints and engineering drawings, track what tools are selected and how they are used, and determine the design and structural quality of the final product. A technology-delivered foreign language assessment can use audio and video to simulate various situations that could be encountered in the foreign country to assess the students' verbal skills, knowledge of the vocabulary, and understanding of the culture and business environment. Using the Internet to obtain information on a particular topic and then to prepare an essay using that information can provide an indication of the individual's information-gathering techniques; ability to locate, analyze, and synthesize information; and skill in documenting the findings in a well-written and succinct document.

- **persons with disabilities:** A powerful use of technology in assessment is in the use of assistive technologies for persons with disabilities. Employment of audio can help persons with visual impairment gain access to testing situations. Persons with impaired physical ability can take advantage of voice recognition technology in answering test items, even to the point of dictating long responses to essay questions. Those who experience difficulty controlling fine motor skills can use a touch screen or smart board to respond to assessment items rather than complete a scannable answer sheet. Persons who are housebound and not able to travel to a test site can take a test over the Internet from their home. Computers are even being created that can respond to slight movements of the head or eyes.
- **outreach to others:** Technologies such as e-mail can provide the test taker with the prospect of reaching out to competent professionals to obtain further information, test interpretation advice, and the chance to discuss a particular situation or test result with an experienced and qualified professional.

Access to technologies such as video teleconferencing can enhance assessments though one-on-one interaction between a test administrator and a test taker. This technology can be used to refine assessments when it is important that the test taker been seen and heard. Some applications are to assess speaking skills, to test language capability by putting a student in touch with persons across the ocean to help critique language performance, or to determine a person's capabilities through interviews or oral exams. Video teleconferencing can have a powerful influence on test security by providing real-time monitoring of the test administration environment.

UNDERSTANDING THE PITFALLS OF ASSESSMENT VIA COMPUTER AND THE INTERNET

Counselors and educators should also be alert to the problems and limitations that can be encountered in using technology in assessment situations. Some potential disadvantages are

- **accessibility:** Some assessments are free and others can be obtained for a fee. Persons with limited resources, and especially those without computers, who may in fact be in more need of assessment services, could be blocked from using essential assessments due to resource restrictions. The Department of Commerce has shown in its most recent study that access to computers and the Internet is highly dependent on income, racial and ethnic group, and urbanicity (U.S. Department of Commerce, 1999).
- **test security:** A major concern about computerized testing and testing over the Internet is the issue of test security. Test items without suitable security can be compromised, resulting in unfair advantage to test takers who might obtain the questions prior to taking an exam. Also, there is the potential for individuals taking assessments via the Internet to acquire information from external sources to answer the test questions. Solutions to test security range from using removable hard drives to tracking or prohibiting access to certain universal resource locators (URLs; Internet addresses).
- **test taker identity:** Test users need to be sure that the person taking the assessment (especially via the Internet) is representing his or her identity accurately. Special care needs to be taken

to ensure that the person answering a licensure test for credentialing, for example, is the actual person that is seeking this certification. Various measures can be taken to reduce the degree of uncertainty. Solutions can range from desktop video teleconferencing to fingerprint recognition systems.

- **privacy/confidentiality:** As with paper/pencil assessments, information about an individual's answers or test scores should be kept confidential and be made accessible only to those individuals who have a need to know. This concern is particularly critical for assessments of a delicate or sensitive nature that are answered over the Internet.
- **lack of information on the quality of the instrument:** Tests taken on computer or over the Internet may not match the quality of paper/pencil assessments. Because taking assessments via the tools of technology is often made to look easy, it can be mistakenly assumed that the test meets professional testing standards. Assuming quality just because a test is available is a potentially dangerous assumption. It is quite possible for a technology-delivered instrument to be deficient in possessing the requisite technical information necessary for a user or test taker to judge the quality and suitability of the instrument. Often little or no information is provided to verify if the instrument has been normed on an appropriate population, if the test results have any validity for decision making in the area in which the test taker intends to use the results, or if it is reliable in assessing a person's condition, status, or performance.
- **test comparability:** If an instrument is available in both paper/pencil and computer-delivered format, it can be mistakenly supposed that the test developers have produced a technology-delivered assessment that provides the same scores regardless of administration format. It is not unusual for some high-quality tests offered in the paper/pencil format to report different results when those same items are administered via computer or Internet. Without the assurance that the test scores are comparable, a test taker may have an advantage by using one format rather than the other. Decisions based on false or different outcomes may point a counselor's client in a wrong direction. Disparate results from noncomparable assessments can transpire for any number

of reasons including speededness, point size of the words, monitor resolution, use of color, comfort with the equipment, and response mode.

- **gender and racial and ethnic fairness:** That females, persons of color, or individuals of different ethnic backgrounds may be disadvantaged in certain testing situations has been a longstanding concern in paper/pencil testing. This can be exacerbated with tests delivered via computer or the Internet. If a particular group has disproportionate access to computers and technology, there could be disparity in the comfort level and familiarity with the use of technology. As a result, test scores could be influenced by the mode of administration in addition to the content.
- **reporting and interpretation:** Immediate feedback is clearly desirable. Without appropriate interpretation, though, there is danger that the test taker will take actions that are not warranted by the test results. The potential exists for interpretations to appear to be so definitive and persuasive that test takers fail to understand the lack of accuracy of the scores and the need for caution surrounding further actions and making decisions. Conversely, there are situations in which the feedback can be so extensive that the test results are overinterpreted to the point of paralyzing a person's actions, or that they are so like a horoscope as to be of little actual value.
- **lack of human contact:** With technology-delivered assessments, meaningful human contact and intervention to assist with test score interpretation and guidance may be lacking or unavailable. Without a skilled educator or counselor, it may be difficult for a test taker to sort out his or her results and use them in the context of other experiences.

FOLLOWING ASSESSMENT STANDARDS AND PRACTICES

How do counselors and educators sort out the promise from the danger? They need to be aware of the various issues related to the construction, production, administration, and interpretation of tests delivered via the computer or Internet. No compromise should be made on the quality of a test administered to a client or

student with either traditional or technology-delivered assessments. Various agencies and organizations have produced policy statements and standards for testing that are applicable to both paper/pencil and technology-delivered assessment. Counselors and educators should be cognizant of and familiar with the premises of these documents when considering the use of technology-delivered assessments. Applicable standards and policies are as follows.

- American Educational Research Association, American Psychological Association, and National Council on Measurement in Education. (2000). *Standards for Educational and Psychological Testing*. Washington, DC: American Educational Research Association.
- American Association for Counseling and Development. (1989). *Responsibilities of Users of Standardized Tests*. Alexandria, VA: Author
- American School Counselors Association and Association for Assessment in Counseling. (1998). *Competencies in Assessment and Evaluation for School Counselors*. Alexandria, VA: Author.
- Committee on Professional Standards and Committee on Psychological Tests and Assessment. (1985). *Guidelines for Computer-Based Tests and Interpretations*. Washington, DC: American Psychological Association.
- Dahir, C. A., Shelton, C. B., and Valiga, M. J. (1998). *Vision Into Action: Implementing the National Standards for School Counseling Programs*. Alexandria, VA: American School Counselor Association.
- Joint Committee on Testing Practices. (1988). *Code of Fair Testing Practices in Education*. Washington DC: National Council on Measurement in Education. This document is being reviewed and should be revised for publication in 2000 or 2001.
- Joint Committee on Testing Practices. (2000). *Test Takers' Rights and Responsibilities*.
- National Board for Certified Counselors. (1998). *Standards for the Ethical Practice of Web Counseling*. Greensboro, NC: Author.
- National Career Development Association. (1997). *NCDA Guidelines for the Use of the Internet for the Provision of Career Information and Planning Services*. Alexandria, VA: Author.
- U.S. Department of Labor Employment and Training Administration. (1999). *Testing and Assessment: An Employer's Guide to Good Practices*. Washington, DC: Author.

USING BEST PRACTICES FOR TECHNOLOGY-DELIVERED TESTS AND ASSESSMENTS

This section identifies best practices that can be used by both test users and test takers to be more resourceful in evaluating and using technology-delivered assessments and to better ensure their appropriate use. The guidelines are consistent with professional standards and are categorized into considerations relevant to test administration, test quality, test developer credibility, test interpretation, and access to professionals. Adherence to these guidelines is of vital importance in reviewing, selecting, and using technology-delivered assessment instruments.

Test Administration

Best practices are as follows.

1. The test setting should be comfortable, quiet, and conducive to allowing the test taker to maximize performance. The arrangement of the computers should ensure privacy and comfort.
2. Testing equipment should be in good working order, and the software and/or Internet programs should be operating properly.
3. A site administrator should be available to troubleshoot problems that may occur due to equipment, software, or other technology failures.
4. Policies and procedures need to be established, explained to the test taker, and applied in cases of a technology failure. For example, if there is a computer crash or a power disruption, are the responses to the test items saved, or does the test taker need to begin the assessment again?
5. Test takers should be comfortable with the test format and use of keyboard or other equipment. If there is a question about the test takers' familiarity with the technology, practice exercises should be provided to enable them to become facile with the equipment in order to focus on the assessment rather than the mode of delivery.
6. Test items and answers must be protected from compromise. Security of the equipment and test items is critical to the fairness of current and future test administrations.

7. The identity of the test taker should be verified, particularly in high-stakes testing.
8. Tests must be administered according to the procedures specified by the test developer, particularly in cases where standardization is important.
9. Both test users and test takers need to know if individual score information is stored; and if so, where and for how long. Periodic purges of individual test results stored locally or centrally may be advantageous in maintaining privacy. It may be more desirable for an individual to save test results on a personal disk rather than on a server or local computer.

Test Quality

Best practices include the following.

1. The test content should match the purpose of the testing. Assessment items should cover, at least on the face, the areas that the test taker and user desire.
2. Clear and supportable statements should be provided by the test developer on what the test is intended to measure so that test users can better ensure that the constructs of the assessment match their intentions.
3. Evidence should be made available by the test developer and reviewed by the test user to determine if the assessment is appropriate for the test taker with regard to age, membership in a subgroup, educational level, disability, and language competence.
4. If the test can also be administered in a paper/pencil format, test results should be comparable to the technology-delivered version. There should be ample evidence that there is comparability in the test scores or that adjustments made to those scores are necessary and appropriate.
5. Evidence should be provided to indicate the conditions under which the test results have been found reliable. The strength of that reliability should be reported by the test developers and examined by the individual considering use of the test.
6. Test results should not be interpreted unless there is validity evidence to support that interpretation. Ample evidence should be presented on the validity of the assessment for particular uses. Care needs to be taken to ensure that the test users or test tak-

ers apply and interpret the test results for a purpose consistent with the validity evidence. For example, if evidence is not provided on the ability of the test result to predict a future expectation, performance, or condition, then the test should not be used for this purpose until evidence is obtained to support that premise.

7. Limitations of the test and test results should be clearly specified by the test developer and examined by the test users prior to selection of the testing instrument. No assessment is without limitations.
8. Published reviews of the assessments created by qualified persons should be reviewed prior to test selection and use.
9. Before test selection, the items and technical information should be examined to determine their currency. Careful consideration of the age of the test and its technical information should be considered before justifying the use of antiquated data or testing forms.

Credibility of the Developers

Best practices related to credibility are as follows.

1. The test user and test taker should determine the identity and professional credibility of the test developer. Evidence of qualifications should be examined, and a determination should be made of adequacy. This may be most important when assessments are published by small companies or individuals without a relevant history of quality work.
2. Test developers should provide information indicating whether they subscribe to precepts of the various testing standards produced by professional organizations. Professional test developers who pledge adherence to various testing standards do attempt to produce high-quality assessments with sufficient technical and research support. Other individuals or organizations may or may not adhere to the standards of quality generally accepted by the profession. Caveat emptor!

Test Interpretation

Best practices concerning interpretation of tests include the following.

1. If tests are computer- or Internet-delivered, they should be scored and the results returned as quickly as possible together with test interpretations that are comprehensive and accurate, given the limitations of the test.
2. Assessment results should not be over- or underinterpreted. Care should be taken not to develop interpretations or explanations that go beyond that which can be supported by the reliability and validity evidence.
3. Test reports should specify appropriate and inappropriate uses of the assessment results.
4. Score reports should include an indication of the degree of accuracy of the results.
5. Score interpretations should specify which interpretations are supported by research and which interpretations are based on expert opinion. Sufficient information should be offered to allow the test taker to weigh the credibility of the expert opinion.
6. Test interpretations should include the limitations of the test and test results, including the specification of common misinterpretations of the assessment results.
7. If scores are used for high-stakes situations such as graduation, promotion, college entrance, placement, and credentialing, the score report should contain information on how the passing or cutoff scores were set.
8. The score and interpretation report should reveal where further information can be obtained about the test and score interpretation, and how a test taker can verify or challenge the accuracy of the score.
9. When possible, the score report and interpretation should include and incorporate other information about the individual, such as previous test scores, educational level, and performance indicators. This information should be used to help the test taker gain further insight into the meaning of the test results.

Access to Professionals

Best practices in relation to access to professionals include the following.

1. Because it is unlikely that the technology-delivered assessment will have information on the background and experiences of the

test taker, a professional educator or counselor should be available to provide value-added interpretations to the assessment information.

2. Where assessment results may require action on the part of the test taker or interventions to change a situation, human assistance is highly desired and should never be replaced by technology.

STAYING CURRENT, KEEPING UPDATED

Because technology is becoming more ubiquitous in our daily lives and the trend is for it to continue to become more and more integrated into our educational and counseling procedures, it is important for professionals to keep tabs on the latest developments in the assessment and technology areas. Information on web sites frequently is expanded and updated faster than information in print format. For these reasons, the following web sites should be checked periodically to identify new and important information related to assessment and its marriage with technology.

- American Counseling Association (http://www.counseling.org)
- American Educational Research Association (http://www.aera.net)
- American Psychological Association—Science Directorate (http://www.apa.org/science)
- American Speech Language Hearing Association (http://www.asha.org)
- Association for Assessment in Counseling (http://www.aac.uc.edu)
- Association of Test Publishers (ATP) (http://www.testpublishers.org)
- Code of Fair Testing Practices in Education (http://assessment.iupui.edu/ncme/code1.html)
- Consortium for Equity in Standards and Testing (CTEST) (http://www.csteep.bc.edu/ctest)
- Council for Exceptional Children, Directory of Current Projects—Assessment (http://www.cec.sped.org/osep/6assessm.htm)
- Education Commission of the States (http://www.ecs.org)
- ERIC Clearinghouse on Assessment and Evaluation (http://www.ericae.net)
- ERIC Counseling and Student Services Clearinghouse (http://www.uncg.edu/edu/ericcass)

- National Assessment of Educational Progress (http://nces.ed.gov/naep)
- National Assessment of Educational Progress (http://www.ed.gov/pubs/ncesprograms/assessment/surveys/naep.html)
- National Association of School Psychologists (http://www.naspweb.org)
- National Association of Test Directors (http://www.natd.org)
- National Center on Educational Outcomes (http://www.coled.wmn.edu/nceo)
- National Center for Education Statistics (http://nces.ed.gov/index.html)
- National Center for Research on Evaluation, Standards, and Student Testing (CRESST) (http://cresst96.cse.ucla.edu/index.htm)
- National Council for Measurement in Education (http://www.assessment.iupui.edu/ncme)

CONCLUSION AND LOOK TO THE FUTURE

Technology provides enabling tools for educators and counselors in locating information on assessment, organizing and maintaining test information, building relationships between and among test results and counseling and guidance interventions, using alternative assessment techniques, assessing difficult areas with traditional formats, introducing efficiencies into the assessment situation, and reaching audiences that are not normally accessible without the availability of certain technologies. Clearly technology can advance opportunities for individuals and guide them where they aspire to go and can flourish.

As we look to the future and realize that the impact of technology on our lives has just begun, there are several issues with which we have to wrestle. These are issues of personal privacy, security, universal access to technology, and the degree of involvement of human interactions in conjunction with technology in the counseling and educational process.

Perhaps the most poignant of these issues for counselors and educators is that the increasing use of technology seems to ignore the importance of the human touch, which represents the artistic part of counseling and education. It is the combination of both the science and the art of counseling that can help individuals to under-

stand themselves more fully, know how their characteristics relate to other information, determine how close they are to a desired goal and what modifications may be needed, and identify what activities and opportunities are available to fulfil their desires and needs. Accomplished and proficient use of technology by qualified counselors and educators can humanize the counseling and educational environment. The power and promise of the future exists in the synergy between the best of both high tech and high touch. Will you be a player?

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